

Remarks

Examiner Pham is thanked for the thorough Office Action.

In the Claims

Independent claims 1, 24 and 46 have each been further amended to include the limitation -- after reflowing -- after "at least one of the one or more pillar structures are bi-layer". Support for this limitation may be found at page 8, the third paragraph, i.e. "Also as shown in Fig. 7, the wafer is subject to reflow to that the optional solder/cap layer 28 is reflowed to form pillar structure 34 of the present invention." Applicants urge that these amendments do not narrow the claims as "pillar structure 34 of the present invention," is what results from subjecting the wafer to reflow. These amendments just make what was implicit and inherent in the claims' term "pillar structure" as defined by the instant invention, explicit.

Claim Rejections

The Rejection Of Claims 1, 46, 69 And 71 Under 35 U.S.C. §102(b) As Being
Anticipated By Kondoh et al. (U.S. Patent No. 5,448,114)

The rejection of claims 1, 46, 69 and 71 under 35 U.S.C. §102(b) as anticipated by Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) is acknowledged.

The Rejection Of Claims 2, 9, 11 To 13, 19, 24, 31, 33 To 35, 41, 47, 54, 56 To 58, 64 And 70 Under 35 U.S.C. §103(a) as Being Unpatentable Over Kondoh et al. (U.S. Patent No. 5,448,114) As Applied To Claims 1, 46, 69 And 71 Above, And Further In View Of The Following Reasons.

The rejection of claims 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 47, 54, 56 to 58, 64 and 70 under 35 U.S.C. §103(a) as being unpatentable over Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) as applied to claims 1, 49, 69 and 71 above, and further in view of the following reasons is acknowledged.

The Rejection Of Claims 3 To 8, 10, 16, 20 To 23, 25 To 30, 32, 38, 42 To 45, 48 To 53, 55, 61 And 65 To 68 Under 35 U.S.C. §103(a) as Being Unpatentable Over Kondoh et al. (U.S. Patent No. 5,448,114) As Applied To Claims 1, 2, 9, 11 To 13, 19, 24, 31, 33 To 35, 41, 46, 47, 54, 56 To 58, 64 And 69 To 71 Above, And Further In View Of Lee et al. (U.S. Patent No. 6,642,136 B1 And The Following Reasons.

The rejection of claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 To 68 under 35 U.S.C. §103(a) as being unpatentable over Kondoh

et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 above, and further in view of Lee et al. (U.S. Patent No. 6,642,136 B1 (the '136 Lee Patent) and the following reasons is acknowledged.

Applicants' wish to briefly point up the claimed features of their invention which are believed to be not shown nor obvious from the teachings of known references in this field. The claims all clearly define: (1) a die comprising a substrate and one or more "pillar structures" (within the meaning of the disclosure of the instant specification and Figures, i.e. "pillar structure(s) 34") formed over the substrate in a pattern wherein at least one of the one or more pillar structures are bi-layer after refowing having a lower lead-free portion and a coextensive upper solder material portion; and (2) a method of forming such a die.

The amendments to independent claims 1, 24 and 46 add the further limitation that at least one of the pillar structures are bi-layer *after reflowing* having a lower lead-free portion and a coextensive upper solder material portion. (emphasis added) while Kondoh discloses, for example, an inner core of copper or nickel surrounded by a solder layer (see Fig. 19). As discussed above, the addition of the terms -- after reflowing -- only makes what was implicit and inherent in the claims' term "pillar structure" as defined by the instant invention, explicit. The term "pillar

structure" in the instant claims is defined a "pillar structure 34" throughout the instant specification as filed and is thus, after the wafer has been subject to reflowing.

On the other hand, the Examiner states in the present Office Action that "[i]t is clearly from the teaching of the above two last extracted passages, the bumps [referring to Fig. 19 of Kondoh] formed in the first extracted passage, before reflowing, have the claimed bi-layer pillar structures..." Page 3, last full paragraph of the present Office Action. As noted above, Applicants' urge that "pillar structure(s)" as claimed in the instant invention, is that structure formed after reflowing as described and taught in the instant invention and thus the claims are patentably distinct over the Examiner's rejections under 35 U.S.C. §102(b) and under 35 U.S.C. §103(a) The addition of the words -- after reflowing -- after "at least one of the one or more pillar structures are bi-layer" in independent claims 1, 24 and 46 just makes explicit what was implicit and inherent in the term "pillar structure(s) as defined in the instant application.

Independent claims 1, 46, 69 (depending from claim 1) and 71 (depending from claim 46) are patentably distinct over Kondoh under 35 U.S.C. §102(b) as Kondoh does not disclose a bi-layer pillar structure *after reflowing*.

Claims 2, 9, 11 to 13, 19, (all depending from amended independent claim 1) 24, 31, 33 to 35, 41, (excepting claim 24, all depending from amended independent claim 24) 47, 54, 56 to 58, 64 (all depending from amended independent

claim 46) and 70 (depending from amended independent claim 24) distinguish over Kondoh under 35 U.S.C. §103(a) as applied to claims 1, 46, 69 and 71 for the above reasoning and further because, *inter alia*: the prior art lack a suggestion that the reference should be modified in a manner required to meet the claims; and the Examiner has not presented a convincing line of reasoning as to why the claimed subject matter as a whole, including its differences over the prior art, would have been obvious.

Dependent claims 3 to 8, 10, 16, 20 to 23, (25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 To 68 distinguish over Kondoh as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 above, and further in view of Lee in combination under §103(a) because neither Kondoh nor Lee, separately or in combination, does/do not disclose or fairly teach *bi-layer* pillar structures *after reflowing* having a lower lead-free portion and an upper solder material portion. Again, as discussed above, Kondoh discloses: a) an inner core of copper or nickel surrounded by a solder layer (see Fig. 19); or b) a tri-layer pillar structure, e.g. as shown in Fig. 11, bump 4 (pillar structure) having lower (lead) layer 52, middle (copper) layer 53 and upper (40% lead/60% tin) layer 54; and further Lee discloses at least a tri-layer pillar structure equivalent (Fig. 10) comprising: upper layer 58 “is a layer of solder compound”, middle (UBM) layer 56 “typically comprising nickel” (Col. 5, line 46) and “may contain multiple layers of metal such as layers of chrome, followed by a layer of copper, followed by a layer of gold” (Col. 6, lines 21 to 23) and lower layer 54 “typically

comprising copper" (Col. 5, lines 42 and 43). So Lee does not cure any deficiency of Kondoh, and visa versa, as applied to the amended claims in the instant patent application. Further, *inter alia*, the prior art lack a suggestion that Kondoh should be modified in a manner required to meet the claims.

Therefore claims 1 to 13, 16, 19 to 35, 38, 41 to 58, 61 and 64 to 71 are submitted to be allowable over the cited references and reconsideration and allowance are respectfully solicited.

CONCLUSION

In conclusion, reconsideration and withdrawal of the rejections are respectively requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone Stephen G. Stanton, Esq. (#35,690) at (610) 296 - 5194 or the undersigned attorney/George Saile, Esq. (#19,572) at (845) 452 - 5863 if the Examiner has any questions or issues that may be resolved to expedite prosecution and place this Application in condition for Allowance.

Respectively submitted,



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